

Data to the People!!!

Regulation, Deregulation, and the Internet Revolution

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Disclaimer

The opinions expressed are those of the speakers and do not necessarily reflect the views of other FCC staff, individual Commissioners, or the Commission



Outline

1. The demand for bandwidth
2. Taxonomy of technologies
3. Issues/Barriers
4. Possible research areas



Internet Trends

■ High rate of growth

- ◆ 1.6 million domain names as of 9/97, up from 30,000 in 1/94

■ Increasing numbers of ISPs

- ◆ Over 4,000 in North America, and 31 national backbones
(Boardwatch July/August 1997 ISP Directory)

■ Innovation in both software and hardware

- ◆ Internet telephony
- ◆ Web TV
- ◆ Push media
- ◆ Java
- ◆ Streaming audio/video
- ◆ Wireless data services

■ Changing usage patterns

- ◆ Ultima Online average time on-line: 6 hours/day



Drivers

■ Internet

- ◆ e-mail
- ◆ World Wide Web
- ◆ Streaming audio and video
- ◆ Desk-top videoconferencing
- ◆ 3D, immersive technologies

■ Digital TV and Video on Demand

■ Videoconferencing



Potential applications for networked services

- Recreation and Entertainment
 - ◆ Total \$370 billion/year (1994)
 - Travel
 - ◆ Domestic travel \$323 billion/year (1993)
 - Health Care
 - ◆ Total \$950 billion/year (1994)
 - Retail sales
 - ◆ Total \$2.34 trillion/year (1995)
 - ◆ Direct marketing (catalogs) -- \$ 46 B/year
 - Education
 - ◆ Total K-12 -- \$275 billion/year (1993)
- (from 1996 Statistical Abstracts)

Show me the money!

■ Telephone	\$ 195 billion
■ Broadcasting	43.5 billion
■ Cable television	25.5 billion
■ Motion pictures	5.5 billion
■ Video rentals	9.9 billion
■ Video games	3.0 billion
■ Computer software	1.4 billion
■ Recorded music	8.4 billion
■ Books	11.2 billion
■ Newspapers	45.7 billion
■ Magazines	23.4 billion

TOTAL

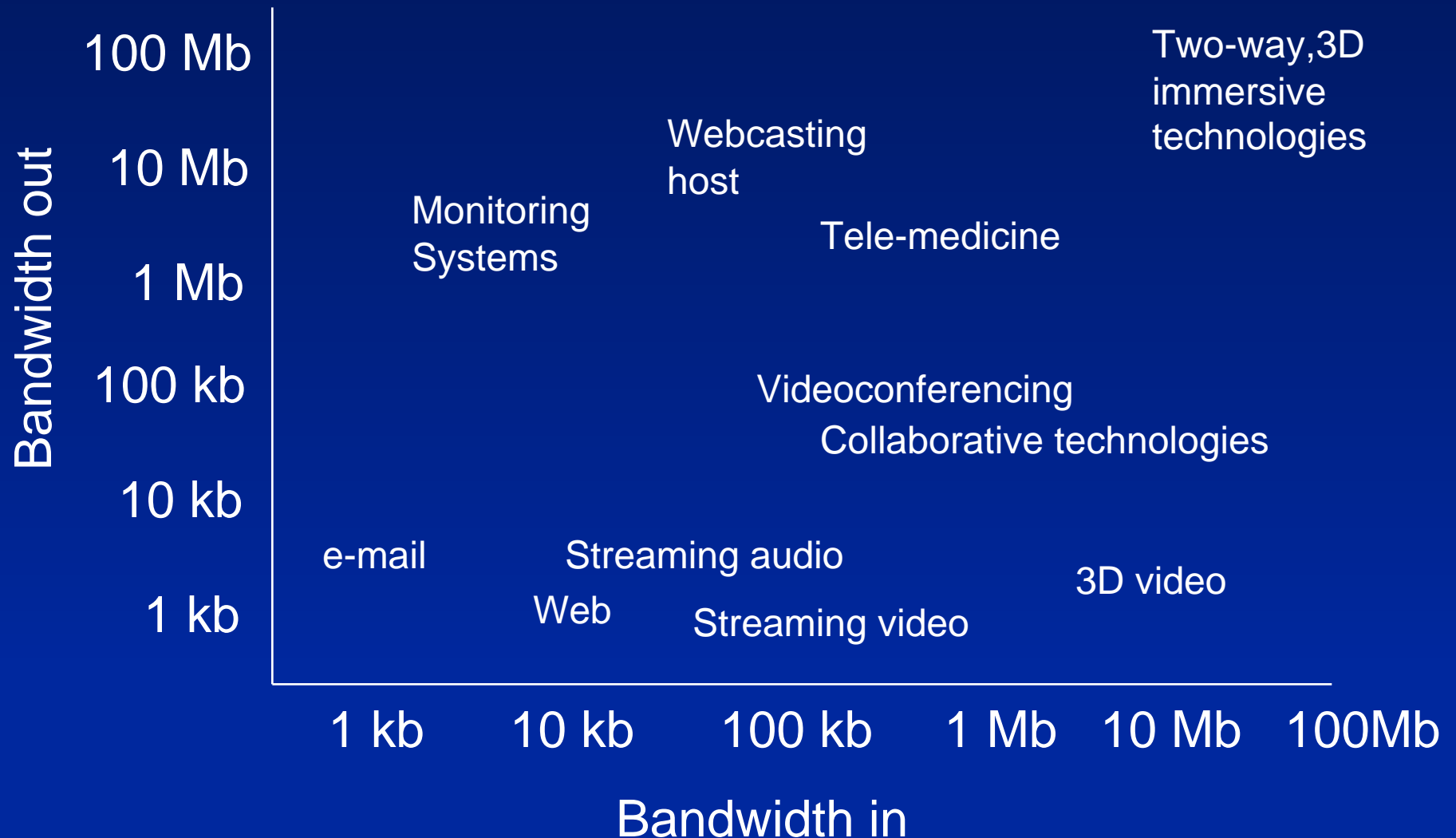
OVER \$370 BILLION

What will the Future Look Like?

- Bandwidth demand will keep growing
 - ◆ continued increase in Internet penetration
 - ◆ push media and streaming video
 - ◆ Internet games
 - ◆ electronic commerce
- Local competition will develop... eventually
 - ◆ too rich to ignore
- Continued experimentation with business models
 - ◆ companies search for the "killer app" and a growth strategy
- Converged networks will emerge
 - ◆ voice just one service on packet-switched data networks
 - ◆ Users will have increased choice and control



Minimum bandwidth requirements for different applications



Key Technologies

■ Wired

- ◆ POTS
- ◆ ISDN
- ◆ xDSL
- ◆ Electric power grid
- ◆ Hybrid fiber coax
- ◆ Fiber to the curb
- ◆ Fiber to the home

Key Technologies (cont.)

■ Wireless

- ◆ LMDS
- ◆ MMDS
- ◆ Digital TV
- ◆ Cellular
- ◆ PCS
- ◆ Fixed wireless
- ◆ Unlicensed spectrum
- ◆ >30 GHz

Key Technologies (cont.)

■ Satellite

- ◆ Geosynchronous
- ◆ Spot beams
- ◆ LEOs (Iridium, Teledesic)
- ◆ MEOs (Ellipsat)

Constraints on deployment

- Technology uncertainty
- Business uncertainty
- Regulatory uncertainty



Technology uncertainty

- Is the technology ready?
- Is it the best technology for the job?
- Is the technology reliable enough?
- Where are we on the cost curve?



Business uncertainty-Demand

- What's the demand?
- What's the killer application(s)?
- How much can we charge?
- How do we educate consumers?
- Who are our competitors?



Business Uncertainty-Supply

- How much will it cost to provide?
- Will we cannibalize existing services?
- Can we change the corporate culture?
- How to deal with workforce issues?



Regulatory Uncertainty

- What new entrants would like:
 - ◆ Clear terms and conditions, fair prices for:
 - ✦ unbundling
 - ✦ interconnection
 - ✦ co-location
 - ◆ Access to spectrum
 - ◆ Access to rights of way
 - ◆ Access to tower/antenna sites



Regulatory Uncertainty

- What the incumbents want:
 - ◆ Access to the long distance market
 - ◆ Pricing flexibility
 - ◆ Deregulation
 - ◆ Incentives for investment
 - ◆ Little or no competition



1996 Telecommunications Act

- Signed February 8, 1996
- Goals:
 - ◆ Give new entrants a chance
 - ◆ Give incumbent telcos access to long distance
 - ◆ Give consumers the benefits of competition (choice, lower prices, new services)
 - ◆ Let Congress, not the courts, set policy



Threw out the old rules

■ Old Approach

- ◆ Assumed natural monopoly
- ◆ Barriers to entry/incumbent protection
- ◆ Defined different services
- ◆ Price regulation or rate-of-return regulation



A Better Way

- The New Approach reflects
 - ◆ Digital Revolution
 - ◆ Explosive growth of data networks
 - ◆ Converging technologies
 - ◆ Converging services
 - ◆ New technologies >> new competitors
 - ◆ Increased availability of capital



Reinventing Regulation

- Policy makers should rely on market forces wherever possible
- (De)regulation should promote increased competition
- (De)regulation should be competitively neutral
- (De)regulation should be investment neutral



Internet Issues at the FCC

■ Policy Goals

- ◆ Competition
- ◆ Innovation and investment
- ◆ Deregulation
- ◆ Increasing bandwidth to businesses and the home
- ◆ More, cheaper, better services for consumers

■ The FCC has supported the growth of the Net

- ◆ “Enhanced” services not subject to traditional carrier regulation
- ◆ Refusal to allow imposition of per-minute interstate access charges on enhanced service providers
- ◆ Created \$2.25 billion fund for access for schools and libraries
- ◆ Using the Internet ourselves to better serve the public

■ What we don't do -- content & crypto



The Paradigm Shift

- Moving from circuit-switched voice to packet-switched open internetworks
- Decoupling network software from hardware
 - ◆ Users benefit immediately from rapid innovation in software, rather than waiting for extensive switch upgrades
 - ◆ Ability to take advantage of scale economies at the edge of the network
- Voice as one form of data, rather than struggling to transmit data through networks optimized for voice
- Traditional regulatory, policy, and business models no longer work



Pressure on Traditional Models

	Common Carriage	Broadcast	Internet
Information Flow	One-to-One	One-to-Many	Any-to-Any
Capacity Constraint	Interconnection	Scarce Spectrum	Statistical Multiplexing
User Role	User-initiated point-to-point communications	Little/no user control (push)	User-initiated and user-controlled (push and pull)



Network Reliability

- Internet usage increasing rapidly
 - ◆ Likely to exceed total traffic on the voice network in 5 years
 - ◆ Increasingly important for "mission critical" applications
- Need for better data about congestion effects
- The only real answer is to get packet traffic off of circuit-switched networks
- Solutions should be industry-driven, but industry must act and government can facilitate



Policy Goals >> Research Needs

■ More competition >>

- ◆ More research on heterogeneous networks
- ◆ More research on systems integration
- ◆ Better interconnection technologies

■ Universal service >>

- ◆ Cheaper, easier-to-use services
- ◆ Better human-machine interfaces

■ Reliable, secure networks >>

- ◆ Research on complex networks
- ◆ Better security technologies



For More Information

■ FCC Web site <<http://www.fcc.gov>>

■ “Digital Tornado” working paper
<http://www.fcc.gov/Bureaus/OPP/working_papers/oppwp29pdf.html>

